

WHAT IS CLAIMED IS:

1. A perpendicular magnetic recording medium comprising:

a nonmagnetic substrate;

5 an underlying film formed on said nonmagnetic substrate; and

a perpendicular magnetic layer formed on said underlying film,

wherein said underlying film has a layer 10 exhibiting a super paramagnetism.

2. The perpendicular magnetic recording medium according to claim 1, wherein said layer exhibiting a super paramagnetism is formed of fine particles exhibiting a super paramagnetism of a soft magnetic material.

3. The perpendicular magnetic recording medium according to claim 1, wherein said layer exhibiting a super paramagnetism has a granular structure having fine particles exhibiting a super paramagnetism of a soft magnetic material dispersed in a nonmagnetic matrix.

20 4. The perpendicular magnetic recording medium according to claim 1, wherein said layer exhibiting a super paramagnetism has a saturation magnetization under the applied magnetic field not higher than 25 3980 A/m in respect of the order of 10^{-8} second corresponding to the magnetic field reversal time of a

recording head and the magnetization is not saturated under the applied magnetic field not higher than 796,000 A/m relative to the order of one second or more.

5 5. The perpendicular magnetic recording medium according to claim 1, wherein said layer exhibiting a super paramagnetism exhibits a soft magnetic properties under the temperature not higher than 10K and exhibits a paramagnetism under the temperature around room temperature.

10 10. The perpendicular magnetic recording medium according to claim 1, wherein the magnetization of said layer exhibiting a super paramagnetism is not saturated under the temperature around room temperature and under the applied magnetic field not higher than 796,000 A/m, and the layer exhibiting a super paramagnetism has a saturation magnetization under the temperature not higher than 10K and under the applied magnetic field not higher than 3980 A/m.

15 15. 7. A perpendicular magnetic recording-reproducing apparatus comprising:

20 a perpendicular magnetic recording medium;
 driving means for supporting and rotating the perpendicular magnetic recording medium;
 a magnetic head including an element for recording
25 information in the perpendicular magnetic recording medium and an element for reproducing the recorded information; and

a carriage assembly supporting said magnetic head which is movable relative to the perpendicular magnetic recording medium,

5 wherein the perpendicular magnetic recording medium comprises a nonmagnetic substrate, an underlying film formed on the nonmagnetic substrate and having a layer exhibiting super paramagnetism, and a perpendicular magnetic layer formed on the underlying film.

10 8. The perpendicular magnetic recording-reproducing apparatus according to claim 7, wherein said layer exhibiting a super paramagnetism is formed of fine particles exhibiting a super paramagnetism of a soft magnetic material.

15 9. The perpendicular magnetic recording-reproducing apparatus according to claim 7, wherein said layer exhibiting a super paramagnetism has a granular structure having fine particles exhibiting a super paramagnetism of a soft magnetic material dispersed in a nonmagnetic matrix.

20 10. The perpendicular magnetic recording-reproducing apparatus according to claim 7, wherein said layer exhibiting a super paramagnetism has a saturation magnetization under the applied magnetic field not higher than 3980 A/m in respect of the order of 10^{-8} second corresponding to the magnetic field reversal time of a recording head and the magnetization

is not saturated under the applied magnetic field not higher than 796,000 A/m relative to the order of one second or more.

11. The perpendicular magnetic recording-
5 reproducing apparatus according to claim 7, wherein said layer exhibiting a super paramagnetism exhibits a soft magnetic properties under the temperature not higher than 10K and exhibits a paramagnetism under the temperature around room temperature.

10 12. The perpendicular magnetic recording-
reproducing apparatus according to claim 7, wherein the magnetization of said layer exhibiting a super paramagnetism is not saturated under the temperature around room temperature and under the applied magnetic
15 field not higher than 796,000 A/m, and the layer exhibiting a super paramagnetism has a saturation magnetization under the temperature not higher than 10K and under the applied magnetic field not higher than 3980 A/m.